

An Exploration into the Practices of Library Web Usability in ARL Academic Libraries

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A survey of the 113 academic libraries of the Association of Research Libraries (ARL) was administered to investigate whether Web usability Policies/Standards/Guidelines (PSGs) are in place, the levels of difficulty surrounding implementation, the impact of PSGs on actual usability practice, e.g., testing, resources, etc., and the relationship between ARL ranking and usability practice or PSGs. The response rate was over 74%. Results show that 25 (30%) libraries have PSGs dedicated to Web usability. Seventy-one (85%) libraries have conducted usability testing on their main Web sites, online public access catalogs (OPAC), or lower-level pages. Nevertheless, only seven libraries performed iterative testing of these platforms at pre-, during, and post-design stages. Statistical analysis indicates that having PSGs does not affect the amount of usability testing performed or the resources available for library Web usability initiatives. In addition, ARL ranking has no or little impact on PSGs, testing, or resources.

Introduction

Web pages, whether used for sales, educational, or informational purposes, need to be thoughtfully crafted for providing efficient functionality. Libraries have eagerly embraced the Web as a platform for reaching patrons and put large amounts of energy into creating a virtual presence. To ensure that the Web medium works, it is essential that the site is developed with the end users' needs in mind. Focusing on usability will help to limit user frustration and enhance a site's functionality, so usability testing and

investing necessary resources, such as staffing and training, are important foundations. Having Web usability Policies/Standards/Guidelines (PSGs) in place may help Web developers and administrators create and maintain consistent and usable Web sites.

In *Research-Based Web Design & Usability Guidelines*, published by the U.S. Department of Health and Human Services, Leavitt wrote that guidelines provide "practical, yet authoritative guidance on a broad range of Web design and communication issues" and that "having access to the best available research helps to ensure we make the right decisions the first time around and reduces the possibility of errors and costly mistakes" (2006, p. ii). In 1998, D'Angelo and Little advocated that "by following sound, research-based guidelines, a library or other organization can be assured that it is represented on the Web in a complimentary manner and that the page to which it provides organized access are useful. . ." (p. 71). Librarians are quite familiar with implementing standards, such as cataloging rules, which help patrons access needed resources (Providenti & Zai, 2007). By documenting PSGs, libraries establish a solid base for implementing quality services (Lingle & Delozier, 1998). In particular, usability PSGs provide important principles to guide Web developers in creating functional, effective Web sites that address the information needs of users.

We hypothesized that Web usability PSGs would influence usability practice within libraries and other institutions. Library literature contains many case studies on usability testing, but there is scarce research on either Web usability PSGs or the use of beneficial resources for implementing good usability practice, such as staffing, training, and resources. One research article, written by Popp (2001), investigated Web usability initiatives among member

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libraries of the Association of Research Libraries (ARL). Her study encompassed testing, methods of acquiring knowledge of Web site evaluation, and the need for continuing education. In addition to expanding on Popp's research, the present study investigates library Web usability PSGs, which to date have not been explored. The purpose of this study is to identify (a) whether Web usability PSGs are in place and levels of difficulty with implementation; (b) the impact of PSGs on actual usability practice, e.g., testing, and resources; and (c) the association between ARL ranking and usability practice or PSGs.

Literature Review

The International Standards Organization (ISO) defines usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (1994, p. 10). E-commerce has incorporated this practice to ensure that commercial Web site interfaces are intuitive. Dumas and Redish (1993) noted that "usability means that the people who use the product can do so quickly and easily to accomplish their own tasks" (p. 4) and focused on four main points: users, productivity, tasks, and ease of use. Rubin (1994) introduced the user-centered design (UCD), also known as usability engineering, for implementation of manufacturing software. Nielsen (1993) has emphasized that usability testing should be continuous.

In 1998, Shneiderman wrote that good Web site design would satisfy users and foster positive attitudes towards the application; his work in this area focused on a task-based model. Rosenfeld and Morville (1998) found that layout and structure of Web sites have a major impact on users and their ability to effectively navigate them. Several other researchers noted that predictable and consistent hyperlinks and navigational tools increase the functionality of a Web site (Lynch & Horton, 1999). In 1997, Spool reported that problems often arise because most Web sites are created with assumptions of more expert knowledge than the users may actually possess. Norman (1998) promotes applying the principles of cognitive psychology to product designs for ease of use. Similarly, Steve Krug (2000) has emphasized the development of intuitive-based Web sites, so that the user can easily navigate for needed information without struggle.

Promoting good Web usability is equally essential for educational purposes, including library initiatives, as for commercial interests. Over the last 20 years, access to library resources has steadily moved from print to digital. The increase in the use of electronic sources, such as journals, reference materials, and government publications has grown exponentially. Complications do occur with this transition; most notably, libraries have had difficulties providing as seamless an interface as other information sources, such as online banking pages (McGillis & Toms, 2001; Travis & Norlin, 2002). Patrons come to the library with varying needs (Gullikson, Blades, Bragdon, McKibbin, Sparling, & Toms, 1999; Cockrell & Jayne, 2002), and access the library

Web site with different tasks at hand (finding a book, borrowing the book, citing the book, etc.), while the need of e-commerce customers tends to be more focused (one task at hand, for example, shopping or making reservations). An increase in distance learning and remote access to library resources makes the library's Web performance even more vital, because in-person access may be impossible for users (McGillis & Toms, 2001; McMullen, 2001; Thomsett-Scott, 2004, 2006).

Testing of a library's main page has been the most common task reported in the literature because this is the virtual entrance to its Web-based resources and experiences the heaviest traffic (e.g., Augustine & Greene, 2002; Church, Brown, & VanderPol, 2002; Dickstein & Mills, 2000; VandeCreek, 2005; Ward, 2006). Libraries are also testing their OPAC's interface because "online catalogues combine the characteristics of a search engine with the online features of a website: they are task-focused, they require substantial use of navigation, and they are often complex, especially for novice users" (van den Haak, De Jong, & Jan Schellens, 2003, p. 342). A variety of approaches have been taken in reviewing OPAC applications, including think-aloud (Battleson, Booth, & Weintrop, 2001; Morrison, 1999; Turner, 2002; van den Haak et al., 2003) and observation (Augustine & Greene, 2002; Chisman, Diller, & Walbridge, 1999). In the literature, reports of testing lower-level Web pages are limited, with efforts ranging from testing informational pages, such as Hours and Help, to research-oriented guides (Battleson et al., 2001; Gibbs, 2002; McDonald, 2002; Thomsett-Scott, 2004; Ward, 2006).

Nielsen advocated that "usability engineering is not a one-shot affair. . ." (1993, p. 71). Cobus, Dent, and Ondrusek noted that usability is a "work in progress subject to ongoing reiterative testing and modification" (2005, p. 242). Researchers in the library science field concur that Web usability testing is a constant endeavor (e.g., Benjes & Brown, 2001; Cervone, 2005; Collins & Aguinaga, 2002; Feldman, 1999; George, 2005; Valentine & Nolan, 2002; Veldof, Prasse, & Mills, 1999; Ward, 2006).

Strategies of usability testing vary across academic libraries. Formal testing using think-aloud protocol is the most commonly employed method. This provides the researcher with the ability to observe and note the users' mental model(s) as they walk through a scripted task (George, 2005; McMullen, 2001; Turnbow, Kasianovitz, Snyder, Gilbert, & Yamamoto, 2005; Ward, 2006; Whang & Ring, 2007). Most usability projects encompass multiple methods beyond the think-aloud protocol, however. One effective pre-design technique is card sorting (Battleson, et al., 2001; Hennig, 2002; McGillis & Toms, 2001; Ward, 2006), which allows the user to categorize task steps for locating information. Paper prototyping provides an inexpensive simulation of an intended design within which subjects can test its information architecture (e.g., Bobay, Dallis, Pershing, & Popp, 2002; Collins & Aguinaga, 2002; Grady, 2000; King & Jannik, 2005; Tolliver, Carter, & Chapman, 2005; Ward, 2006). Some researchers utilize screen-capturing software, such

as Camtasia, to facilitate more in-depth analysis (Ascher, Lougee-Heimer, & Cunningham, 2007; Clark, 2004; Cobus et al., 2005; Goodwin, 2005; Thompson, 2003). Libraries also employed surveys and focus groups to solicit input for pre- and post-design efforts (e.g., Ascher et al., 2007; Battleson et al., 2001; Crowley, Leffel, Ramirez, Hart, & Armstrong, 2002; Thomsett-Scott, 2004; Turnbow et al., 2005; VandeCreek, 2005; Ward, 2006).

To implement usability methods and/or testing tools, libraries need additional resources, including staffing, training, and technical expertise. Some institutions employ graduate or other student assistants (Kuregger, Ray, & Knight, 2004; Ward, 2006); others collaborate with academic departments (Clark, 2004; Manzari & Trinidad-Christensen, 2006; Ward & Hiller, 2005) or Human-Computer Interaction Institutes (George, 2005) to oversee testing. Off-campus consultants are also utilized to assist with the testing process or to facilitate focus groups (Tolliver et al., 2005; VandeCreek, 2005). Some libraries have commissioned expert consultants in creating new information architecture (Bobay et al., 2002; King & Jannik, 2005). Veldof and Nackerud believe “that librarians can and should develop in-house competencies and experience. Usability is one of the best ways to learn about your users—their needs, their habits, and their requirements with the online library systems you create” (2001, p. 20). Cervone (2005) advocated conducting organization-wide training on Web usability and the implementation of a training plan to increase skills and awareness. However, Popp (2001) found little consensus in the approaches for acquiring usability knowledge.

In order to accomplish these ongoing and multi-faceted Web usability initiatives, well-defined policies, standards, or guidelines are crucial in facilitating the development of quality Web sites that meet users’ needs. The research on the PSGs that govern the activities of library Web builders has focused on site management and accessibility. Some researchers have reviewed general Web site policy issues that address the technical and procedural aspects of Web development (Lingle & Delozier, 1998; Ryan, 2003). Shropshire (2003) noted Web site management concerns, in particular with staffing and governance. Respondents to her survey felt that Web site governance does not fit into the traditional administration structure. In 2000, Welch proposed a model for Web site management, which provides guidance with usability issues, including governance, site evaluation, and design. Lombard and Hite (2007) investigated university guidelines and their impact on library users’ needs.

During the early stage of the World Wide Web, Stover and Zink (1996) reviewed patterns of higher education library home pages. In their research, they reported that most institutions had very informal guidelines and highlighted Yale University’s emphasis on mental model:

On the issue of a “mental model,” the Yale guide stresses that a great deal of latitude must be granted since no one model is better than another in organizing a Web site. The structure of the document can be linear, spatial, or hierarchical. Metaphors or organizational models that can be used in designing Web

documents include a traditional book format, a library of documents, an encyclopedia metaphor, and a multi-dimensional conceptual model. Whatever mental model is used should be utilized consistently and be obvious and familiar to the user. (p. 10)

Providenti and Zai (2007) reviewed accessibility policies and related issues but did not explicitly address the necessity of functionality on the site. Spindler (2002) examined accessibility among the homepages of mid-sized college and university libraries utilizing guidelines initiated by W3C. The United States government established regulations for Web accessibility under the Americans with Disabilities Act. However, a Web site with accessibility does not guarantee usability.

Literature discussing Web usability PSGs is very limited. Nielsen (1994) proposed 10 usability heuristics in his monograph *Usability Inspection Methods*; he also provided design guidelines for building intuitive Web sites (Nielsen, 2000). Lynch and Horton (1999) outlined user-centered principles for creating more usable Web sites. Wroblewski and Rantanen (2001) acknowledged that these guidelines help facilitate the implementation of a good Web interface; they also recommended a set of specific guidelines for increasing usability of complex Web-based applications. The Department of Health and Human Services’ (HHS) extensive guide, *Research-Based Web Design & Usability Guidelines* (2006), provides a sound base for creating Web usability PSGs. The intent of this resource is to provide “quantified, peer-reviewed Web site design guidelines” (p. xv) that “will help enable organizations to make more effective design decisions” (p. xvi). Bevan and Spinhof (2007) compared usability guidelines and standards by HHS and ISO and created a more comprehensive checklist derived from both resources.

Although the literature contains Web usability PSGs, we did not find studies of the association between PSGs and usability practice. Our research takes initial steps to explore this area of interest among ARL academic libraries. We sought to meet the following objectives:

- To survey the current state of Web usability PSGs in ARL academic libraries, including their development and implementation.
- To determine whether Web usability PSGs have any impact on the frequency of usability testing being conducted.
- To investigate the relationship between the levels of perceived importance of Web usability testing and the actual efforts made to do so.
- To assess whether available resources, such as personnel, committees, task forces, etc., affect the amount of testing.
- To determine whether ARL ranking has any effect on usability practice and/or the existence of PSGs.

Methodology

For the target population of this study, we selected the academic library members of the Association of Research Libraries. These libraries uphold a set of specific criteria for membership including collection size, annual monograph

and serial acquisitions, library budget, and library staff. ARL uses these statistics to create an index to rank research libraries; this method has traditionally been a measure of library resources (Kyrillidou, 2000). Because ARL libraries are identified as the most prestigious research libraries in North America, the researchers expected that these libraries would make a comparable investment in their usability initiatives (e.g., staffing and testing). With this expectation, the higher-ranked libraries would support greater usability efforts to provide patrons with intuitive Web sites guided by sound Web usability PSGs, which would serve as examples to other libraries.

This project originated in November 2006 when we visited the Web sites of these libraries to collect information about general library Web usability PSGs and library-specific Web usability PSGs. Having found few PSGs via this method, we created a more comprehensive data-gathering approach by directly surveying these libraries. Drawing from the above usability research objectives, we constructed a draft questionnaire. The final survey consisted of 18 questions and focused on three major research questions: usability PSGs, usability testing, and resource issues (see Appendix). We asked several questions on the status and perspectives of PSGs at the library and institutional levels. They also requested copies of these PSGs; an analysis of the PSGs will be compiled and published at a future date.

The survey also contained questions on usability testing, including population, testing methods, iterative testing, and the perceived importance of usability testing. In addition, recipients were queried about library resources, such as staffing, committees, and the use of outside assistance. The survey consisted of multiple choice, Likert scale, and open-ended questions that allowed participants to provide additional information that the multiple-choice format could not capture. Because the survey procedure involves human subjects, we submitted the research proposal to the IRB at the University's Office of Research Compliance and received permission to proceed in April 2007.

In May 2007, the questionnaire was made available online and colleagues were asked to test the instrument; based on feedback, we edited the survey for clarity. We selected their survey recipients by visiting each ARL academic library Web site. We believed that the person in charge of Web usability would be the best candidate for completing the survey. However, identifying the point person turned out to be more challenging than expected since many library staff directories did not list position titles. In addition, the title of this specialized position varies from one institution to another. In some cases, it is Web Administrator, in others, Chair of Web Advisory Committee, Head of Web Services, Coordinator of User Services, etc. After this preliminary search, the researchers called each library to verify or inquire about a specific contact person.

In early October 2007, after the questionnaire was set up using SNAP, an online survey application, we performed another test, receiving additional feedback and suggestions for the final version. In November, we finalized the survey

instrument and distributed it to the 113 ARL academic libraries. Over the next 2 months, we sent e-mail reminders and made follow-up phone calls to increase the response rate. By the time the survey was closed in late January 2008, 84 institutions had completed the survey for a return rate of 74%.

We exported data from SNAP to Excel and used SPSS for quantitative analysis. We also downloaded answers to open-ended questions and coded the texts for analyzing the qualitative results. Among these 84 institutions, five provided two responses: one from their main library, the other from one of their branch libraries. In these cases, the responses pertaining to the main university libraries were selected for this study's analysis.

For the analysis, the researchers utilized a *t*-test to determine whether there was a difference in ARL academic library rank between libraries with and those without PSGs. We also applied paired samples *t*-test to identify gaps in difficulty with implementing varying PSGs. In addition, we employed Pearson's Correlation to examine if a statistically significant correlation existed between two scale-level variables, such as ARL ranking and the level of perceived importance of usability testing.

Survey Results and Data Analysis

Web Usability PSGs

As noted above, the survey instrument queried respondents about the status of PSGs found in the academic libraries of ARL. Of the 84 respondents, 34 (40%) have general library Web PSGs that address usability among other topics and 25 (30%) have established PSGs dedicated to usability alone (see Table 1); 41 (49%) have at least one of these two types of in-library PSGs. However, 43 (51%) of the libraries do not have in-library PSGs that address usability. Survey responses revealed that 30 (36%) libraries are at universities with institutional Web usability PSGs (see Table 1); 26 (87%) are following those guidelines. The four libraries not following their institutional Web usability PSGs identified reasons for non-compliance as lack of enforcement, partial compliance, and Web site redesign transition. To determine any relationship between ARL ranking and the status of PSGs, a *t*-test was conducted comparing the ARL rankings of the surveyed libraries that have library Web PSGs with those that do not; the analysis showed that the difference is not statistically significant with $p > 0.05$. A similar result was found when comparing library Web usability PSGs.

We were interested in the difficulties with implementing usability-related PSGs. Of the 32 libraries that responded to the question focusing on general library Web PSGs, five (15%) reported no difficulty, eight (23%) experienced slight difficulty, and 16 (47%) identified moderate difficulty. Of the 25 libraries that have specific usability PSGs, 23 identified their difficulty levels: four (16%) had no difficulty, two (8%) stated slight difficulty, 15 (60%) encountered moderate level of difficulty, and two (8%) found them very difficult. Among the 26 libraries that use their institutional Web usability PSGs, 12 (46%) acknowledged no difficulty, eight (31%) selected

TABLE 1. Libraries/universities with/without PSGs.

	Library Web PSGs	Library Web usability PSGs	University Web usability PSGs
	No. of libraries (%)	No. of libraries (%)	No. of libraries (%)
With	34 (40%)	25 (30%)	30 (36%)
Without	50 (60%)	58 (69%)	31 (37%)
Not sure			22 (26%)
No answer		1 (1%)	1 (1%)
Total	84 (100%)	84 (100%)	84 (100%)

TABLE 2. Levels of difficulty in implementing in-library/university Web usability PSGs.

	Library Web PSGs (n = 34)	Library Web usability PSGs (n = 25)	University Web usability PSGs (n* = 26)
	No. of libraries (%)	No. of libraries (%)	No. of libraries (%)
Not difficult	5 (15%)	4 (16%)	12 (46%)
Slightly difficult	8 (23%)	2 (8%)	8 (31%)
Moderately difficult	16 (47%)	15 (60%)	5 (19%)
Very difficult	3 (9%)	2 (8%)	
No answer	2 (6%)	2 (8%)	1 (4%)
Total	34 (100%)	25 (100%)	26 (100%)

Note. n = number of libraries reported that they have PSGs.

n* = number of libraries reported that they followed their universities' PSGs.

the slightly difficult option, and five (19%) reported moderate difficulty (see Table 2).

Pair-wise *t*-tests were conducted to compare the levels of difficulty in implementing PSGs: library Web PSGs versus library Web usability PSGs, library Web usability PSGs versus university Web usability PSGs, and university Web usability versus library Web PSGs. The results showed that library Web usability PSGs were significantly more difficult to implement than university Web usability PSGs. The mean difficulty rating for library Web usability PSGs is 2.5 versus 1.7 for university Web usability PSGs ($p < 0.05$, $n = 10$, with 1 being *not difficult* and 4 being *very difficult*). The results also indicated that difficulty in implementing library Web PSGs was highly correlated with difficulty in implementing library Web usability PSGs ($r = 0.73$, $p < 0.001$, $n = 17$).

An open-ended question provided participants with the opportunity to expand on reasons for experiencing difficulty with implementing PSGs. We used grounded theory method to develop concept categories. Issues related to enforcement/agreement were reported as the primary reason(s) for having difficulty with implementing in-library PSGs. Difficulty with enforcement was due to the inability to mandate content creators to follow the PSGs. Some libraries noted that there was a lack of emphasis on implementing the PSGs. Agreement issues refer to stakeholders disagreeing with PSG specifics mainly because they interpret usability differently. One library even noted that their library Web usability PSG has usability problems! At the institutional level, technical issues were major obstacles for executing university Web usability PSGs. Several libraries stated that their institutional Web usability PSGs are ambiguous (see Table 3).

Usability Resources—Committees/Task Forces

Because Web site development involves many stakeholders, some libraries organize committees to gather input and feedback and oversee usability projects. The survey asked the respondents to identify the existence of the following committee types: usability committee, Web advisory committee, Web site usability subcommittee. Of the 84 libraries, 52 (62%) have Web advisory committees and 15 (18%) have usability committees (see Table 4). We further analyzed the responses and found that 60 libraries (71%) identified having at least one type of committee listed in the survey; 15 (18%) have two committees, and two libraries (2%) have all three types of committees (see Table 5). Several libraries indicated they do not have any of these types of committees; however, they noted in the "other" category that they have some sort of *ad hoc* committee, campus wide committee, or user study groups that address usability issues.

Usability Testing

Attesting to its perceived value, the library literature on Web usability testing has proliferated over the last ten years. We further explored this trend by asking the survey population to rate the importance of usability testing within their respective libraries. Seventy-nine (94%) of the 84 libraries answered this question. Two (2.3%) noted that it was not important, 15 (17.9%) indicated that it was somewhat important, 21 (25%) specified that it was important, 34 (40.5%) chose the "very important" answer, and seven (8.3%) selected the "extremely important" option (see Table 6). Of the 84 respondents, 71 (85%) have conducted usability testing, 11

TABLE 3. Reasons of difficulty with implementing PSGs.

	Library Web PSGs	Library Web usability PSGs	University Web usability PSGs
	No. of libraries	No. of libraries	No. of libraries
Enforcement/Agreement	13	7	2
Lack of skills/training	7	3	1
Resources	4	3	1
Getting informed	3	1	2
Resistance to change	2	2	
One size doesn't fit all/complexity	2	1	1
Technical issues	1	2	4
Difficulty with lower level pages		2	
Difficulty with OPAC		1	
Unclear PSGs (PSGs lack clarity)			2

TABLE 4. Committees formed by libraries.

	Usability committee	Web advisory committee	Web site usability subcommittee
	No. of libraries (%)	No. of libraries (%)	No. of libraries (%)
Yes	15 (18%)	52 (62%)	12 (14%)
No	42 (50%)	14 (16%)	34 (40%)
Not sure	1 (1%)	3 (4%)	3 (4%)
No answer	26 (31%)	15 (18%)	35 (42%)
Total	84 (100%)	84 (100%)	84 (100%)

TABLE 5. Number of committee types formed by the libraries.

No. of committee types	No. of libraries (%)
Three	2 (2%)
Two	15 (18%)
One	43 (51%)
None	13 (16%)
No answer	11 (13%)
Total	84 (100%)

TABLE 6. Rating on the importance of usability testing.

Rating	No. of libraries	%
Not important	2	2.3%
Somewhat important	15	17.9%
Important	21	25.0%
Very important	34	40.5%
Extremely important	7	8.3%
No answer	5	6.0%
Total	84	100%

(13%) have not (see Table 7). An interesting finding was that these 11 libraries provided no reason for not conducting usability testing even with additional prompting. To determine whether there is a relationship between ARL ranking and the perceived importance of usability testing, we assigned scores to the levels of usability testing importance, with 1 being *not important* up to 5 being *extremely important*, and then computed the correlations between these two variables. The result showed that the rating of importance of usability testing does not correlate with the ARL library ranking.

TABLE 7. Libraries conducting Web usability testing.

Conducted Web usability testing	No. of libraries	%
Have	71	85%
Have not	11	13%
No answer	2	2%
Total	84	100%

TABLE 8. Comments on importance of usability testing.

Theme	No. of libraries
Iterative testing	19
Buy-in	13
Staff/Resources	12
On-campus usability partnership	6
Committee	6
Accessibility	3
Web usability PSGs	2
Training	2

We asked each respondent to elaborate and provide specific comments about the importance their library placed on usability testing. Respondents most frequently cited the importance of iterative testing, which reflects trends observed in the literature. Library-wide buy-in was the next most pressing need. In addition, respondents noted staffing and resources as vital components necessary for usability testing. Other comments highlighted the importance of on-campus partnerships and library usability committees (see Table 8). We found it odd that few concerns arose for Web usability PSGs or accessibility.

TABLE 9. Number of libraries testing on the three Web platforms: pre-, during, and post-design phases.

	Web site			OPAC			Lower level pages		
	Pre	During	Post	Pre	During	Post	Pre	During	Post
1	15	12	16	8	9	11	11	11	12
2	13	16	11	6	6	10	9	18	11
3	9	11	9	2	4	4	7	7	10
4	1	2	2	1	1	2	1	3	4
5 or more	10	15	15	2	2	3	5	7	7
Sub total	48	56	53	19	22	30	33	46	44
None	19	10	12	38	34	32	28	20	21
Total	67	66	65	57	56	62	61	66	65

TABLE 10. Testing the three Web platforms during the development life cycle.

	Web site	OPAC	Lower level pages
	No. of libraries	No. of libraries	No. of libraries
Testing at all three development stages	37	8	26
Testing at any two of the three stages	18	12	18
Testing at any one of the three stages	10	23	9
Total	65	43	53

To identify trends in Web usability across the varying library Web platforms (i.e., library main page, OPAC, and lower-level pages), we queried testing patterns. Because the usability literature emphasizes that testing be performed throughout the development cycle of a system “to expose usability deficiencies and gradually shape or mold the product in question” (Rubin, 1994, p. 22), we asked participants to indicate the number of times testing was conducted at each of the design stages: pre, during, and post. Results showed that main Web pages are tested most frequently (see Table 9). Sixty-five of the 71 libraries (91.5%) reported testing their main sites at least once; 37 (52%) have tested at all design stages. Of the three platforms, the OPAC tends to be tested the least, with 43 (60.5%) of the libraries reporting testing it at least once and only eight of those (11.3%) had conducted testing at all three design phases. Fifty-three of the libraries (74.6%) indicated that they had tested their lower-level pages at least once, and approximately 50% (26) of them had performed testing at all the design stages (see Table 10). Only seven libraries have tested all the platforms at all three design phases.

We were curious as to whether libraries that have Web usability PSGs tend to conduct more testing than those that do not. *T*-test analyses revealed that neither the existence of library Web PSGs nor library Web usability PSGs impacted the amount of testing on the three platforms. The researchers analyzed Pair-wise correlations among the number of usability tests performed on the three platforms and the difficulties with implementing the three types of PSGs. Findings indicated that testing the OPAC is negatively correlated with difficulty in implementing both library Web PSGs ($r = -0.49$, $p < 0.05$, $n = 23$) and library Web usability

PSGs ($r = -0.51$, $p < 0.05$, $n = 18$). Thus, the more difficulty with implementing the PSGs, the less testing is done on the OPAC sites. We further explored the correlations between perceived importance of usability testing and the actual testing of the three Web site platforms. The results showed that only the testing of the main library site correlated with perceived importance of usability testing ($r = 0.31$, $p < 0.01$). In addition, there is a weak relationship between the total amount of testing across the three platforms and the perceived importance of usability testing ($r = 0.30$, $p < 0.05$).

Because students, faculty, and staff are the prime users of academic libraries, we expected that these populations would be the most utilized participants in usability testing. This assumption proved to be true: 68 (95.8%) libraries recruited both undergraduates and graduates, 60 (84.5%) had faculty participants, and 58 (81.7%) involved staff. Many libraries also asked researchers, people with disabilities, and IT professionals to participate (see Table 11). In the “other” category, one respondent stated that the testing population depended on the target audience of the page.

In addition, the survey found that many libraries use multiple testing methods. The most frequently used methods are in-person observation with 61 libraries (86%) and think-aloud protocol with 57 libraries (80%). Card sorting is the next most widely used approach, with 40 libraries (56%). Because usability is task-oriented, we expected that libraries would incorporate task analysis in their testing initiatives and 39 (55%) of the libraries did so. Similar to the task analysis approach, 39 libraries (55%) employed cognitive walk-through based on task scenarios. Thirty-six libraries (51%) conducted paper prototyping/story boarding. Thirty-two (45%) applied heuristic evaluations. Less-used methods

TABLE 11. Testing population used by participating libraries conducting usability tests.

	Administrators	Alumni	Faculty	Graduates	Under-graduates	Public users	Non-library users	IT professionals	Persons with disabilities	Researchers	Staff
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Yes	20 (28.2%)	11 (15.5%)	60 (84.5%)	68 (95.8%)	68 (95.8%)	16 (22.5%)	15 (21.1%)	21 (29.6%)	29 (40.8%)	35 (49.3%)	58 (81.7%)
No	41 (57.7%)	49 (69%)	7 (9.9%)	1 (1.4%)	1 (1.4%)	43 (60.6%)	41 (57.8%)	37 (52.1%)	33 (46.5%)	25 (35.2%)	7 (9.9%)
No answer	10 (14.1%)	11 (15.5%)	4 (5.6%)	2 (2.8%)	2 (2.8%)	12 (16.9%)	15 (21.1%)	13 (18.3%)	9 (12.7%)	11 (15.5%)	6 (8.4%)
Total	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)

were filmed observation and keystroke path collection (see Table 12). Others noted that they utilized field studies in context as well as analysis of usage statistics of their current Web sites.

To investigate whether there is a relationship between the number of testing methods and staff hours devoted to usability testing, we computed correlations between these two variables and found no significant association. In addition, we examined the relationship between the number of testing methods used and the iterative testing of the three Web platforms. Using more methods is not statistically significant in relation to iterative testing ($r = 0.25$, $p = 0.06$).

Past literature notes that in addition to these usability testing methods, libraries use many other techniques to solicit input. These include qualitative methods, such as focus groups and interviews, as well as quantitative survey-based methods. The results of this study indicated that the most popular method was focus groups followed by surveys, interviews, and a "Call for Input" on their Web sites. The least used methods included listserv postings and pop-up windows via the library Web site (see Table 13). Many libraries received feedback from other venues including comments submitted to their Webmasters, blogs, discussion forums, and results derived from LibQUAL+ (an online library services assessment survey initiated by ARL).

Usability Resources—Personnel

Having staff support is another important aspect for implementing usability strategies. We investigated the use of regular staff primarily dedicated to issues of Web usability (thereafter referred to as dedicated staff) as well as regular staff who take on Web usability responsibilities (thereafter referred to as regular staff). Of the 84 libraries, 24 (28%) reported having dedicated staff (see Table 14); of these, 20 (83%) were full-time and 4 (17%) were part-time. We analyzed the data to determine if there is a relationship between the number of hours dedicated to Web usability and ARL ranking. The results show that there is a weak association between the ranking and the hours worked by dedicated staff ($r = 0.37$, $p = 0.001$), but there is no relationship between the ranking and the hours devoted by regular staff.

We believe that training is critical for conducting usability testing, so we asked for the types of training staff members received. Of the 24 libraries with dedicated usability staff, 18 (75%) indicated having some form of training: six had training in Human-Computer Interaction (HCI), 14 had training in Web usability, and 14 had a certificate or degree in Library/Information Science (see Table 15). Five (21%) of the dedicated usability employees have received all three training types, six (25%) have had two types, and seven (29%) have had one (see Table 16). Several noted self-training through on the job experience, attending conferences, or reading professional literature.

An analysis of the regular staff patterns showed that 51 (60%) libraries have staff whose duties include Web usability (see Table 17); forty-six (90%) of these staff members are

TABLE 12. Usability testing methods applied by libraries conducting usability tests.

	Card sorting	Cognitive walk-through	Filmed observation	Heuristic evaluation	In-person observation	Keystroke path collection	Paper prototyping	Task analysis	Thinking aloud
	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)	Count (%)
Yes	40 (56%)	39 (55%)	23 (32%)	32 (45%)	61 (86%)	17 (24%)	36 (51%)	39 (55%)	57 (80%)
No	27 (38%)	24 (34%)	38 (54%)	28 (39%)	6 (8%)	41 (58%)	28 (39%)	27 (38%)	9 (13%)
No answer	4 (6%)	8 (11%)	10 (14%)	11 (16%)	4 (6%)	13 (18%)	7 (10%)	5 (7%)	5 (7%)
Total	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)

TABLE 13. Methods used to solicit feedback.

	Focus groups	Interviews	Listserv postings	Pop-up windows via the library Web site	Surveys	Web site "call for input"
Yes	55 (77.5%)	49 (69.0%)	13 (18.3%)	13 (18.3%)	51 (71.8%)	45 (63.4%)
No	11 (15.5%)	15 (21.1%)	45 (63.4%)	43 (60.6%)	13 (18.3%)	19 (26.7%)
No answer	5 (7.0%)	7 (9.9%)	13 (18.3%)	15 (21.1%)	7 (9.9%)	7 (9.9%)
Total	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)	71 (100%)

TABLE 14. Libraries employing dedicated Web usability staff.

	No. of libraries	%
With	24	28%
Without	57	68%
No answer	3	4%
Total	84	100%

TABLE 15. Types of Web usability training for dedicated staff.

Training	No. of dedicated staff
Human-Computer Interaction (HCI)	6
Web usability	14
Degree or certificate in information science	14
No specific training	5
Total	39*

Note. *As multiple responses were allowed for this question, the total adds up to more than 24.

TABLE 16. Number of training types for the dedicated Web usability staff.

Number of training types	Dedicated staff count	%
Three	5	21%
Two	6	25%
One	7	29%
None	6	25%
Total	24	100%

full-time and five (10%) have part-time status. Training for regular staff included 16 persons who had training in HCI, 36 with training in Web usability, and 21 with a Library/Information Science degree or certificate (see Table 18). Six (12%) employees engaged in three forms of training, 20 (39%) had two, 15 (29%) had a single form, and 10 (20%) did not have any form of training (see Table 19).

TABLE 17. Number and percentage of libraries with/without regular staff whose responsibilities include Web usability.

	No. of libraries	%
With	51	60%
Without	30	36%
No answer	3	4%
Total	84	100%

TABLE 18. Types of training the regular staff had regarding Web usability.

Training	No. of regular staff
Human-Computer Interaction (HCI)	16
Web usability	36
Degree or certificate in Information Science	21
No specific training	10
Total	83*

Note. *As multiple responses were allowed for this question, the total adds up to more than 51.

Several forms of training were specified, including specialized single-day workshops and conferences that focused on IA (information architecture), user experience, Web usability, and survey testing. In addition, many respondents conducted self-guided reading of professional literature. An analysis of the results indicated that training does not relate to either the amount of testing methods used or performing iterative testing.

The survey asked about the number of hours that staff spent on usability work. The total weekly hours for institutions with dedicated staff ranged from 1 to 30 hours per week. The libraries with regular staff ranged from less than 1 hour to 25 hours weekly. We compared the mean number of hours worked per week between dedicated and regular staff and found that, on average, dedicated staff spend 14.21 hours on usability, while regular staff spend 5.5 hours weekly.

TABLE 19. Number of training types the regular staff had.

No. of training types	No. of regular staff	%
Three	6	12%
Two	20	39%
One	15	29%
None	10	20%
Total	51	100%

TABLE 20. Number of assistance types received by the libraries.

No. of assistance types	No. of libraries	%
Two	2	2.4%
One	19	22.6%
None	59	70.2%
No answer	4	4.8%
Total	84	100.0%

By exploring the departments that employ usability personnel, we believed we could determine patterns on whether usability is more commonly public service-oriented or information technology-focused. The survey results showed that dedicated staff were most frequently employed in either the Information Technology or Web Services departments, with 19 of the 23 libraries having dedicated staff in these departments. Only three were members of a user/public services unit; one was employed in research/assessment. Results about the regular staff indicated a similar pattern. Twenty-seven of the libraries had IT/Web personnel who were engaged in usability initiatives. The remainder of this staff broke down to the following departments: five in administration, four in instruction/reference, three in user services, two in research/assessment, and one in communications. Four libraries noted that responsibilities were distributed across a variety of departments. Most common staff titles were Web Services or Web Development Librarian, while more esoteric titles included Solutions Architect, User Experiences Librarian, and Digital Resources Editor. The survey included a question about the type of assistance received from other institutional units or outside consultants for Web usability projects. Twenty-one of the 84 libraries (25%) used either another unit of the university, such as Information Technology, or hired outside consultants, or both; 59 (70.2%) libraries solicited no outside assistance (see Table 20). Most frequently IT/Web Services staff members coordinate on-campus/consultant assistance.

We aggregated the number of committees, training formats, outside assistance types as well as staff (with “1” being part-time and “2” being full-time) for each participating library and compared the resource means between libraries with Web usability PSGs and those without. The results of a *t*-test revealed that the mean difference is not statistically significant (4.92 versus 3.91, $p > 0.05$). We wondered if more resources would facilitate testing and ran a correlative

TABLE 21. Future plans identified by participating libraries.

Plan	No. of libraries
Conduct usability testing	26
Redesign library Web site	14
Use alternative methods (focus groups, interviews, surveys, click paths)	9
Acquire resources (outside assistance, funding)	8
Conduct iterative testing	7
Add usability committee, personnel, task force	6
Test OPAC	6
Implement CMS	4
Establish policies	3
Test lower level pages	1

analysis, which indicated that as resources increased, the more testing was conducted ($r = 0.44$, $p = 0.000$). We further examined the association between ARL ranking and resources since we suspected that libraries with higher ARL standing would have more resources to support their usability initiatives. Based on the Pearson Correlation value, there appears to exist a weak relationship between the ARL ranking and available resources ($r = 0.31$, $p = 0.004$).

Future Web Usability Plans

Forty-four libraries identified a number of goals (see Table 21). The most prominent endeavors are to conduct usability testing and redesign the library’s Web site. Only three libraries stated that they plan on refining or establishing usability PSGs. In addition to the survey questions, we provided space for additional comments. Many of these echoed earlier responses on the importance of on-campus partnerships, the need for future usability initiatives, and resources to support them. One respondent aptly added that there are difficulties in connecting with the administration on the topic of Web design and usability mainly because there are ambiguities among each stakeholder’s definition of design. In addition, there seems to be reluctance toward risk-taking in development, resulting in no real action with usability being taken. One follow-up comment did address PSGs; however, the focus was more on accessibility for users with disabilities rather than usability as a whole.

Discussion

As noted earlier, many prominent experts have been working on issues and solutions related to Web usability. Nielsen (1994), Shneiderman and Plaisant (2004), and many other scholars have provided sound usability principles to help Web developers create intuitive Web sites. One source, the *Research-Based Web Design & Usability Guidelines* offers no fewer than 209 informative guidelines (United States Department of Health and Human Services, 2006), which Web creators and administrators can utilize to make informed decisions for adhering to usability. These various principles also provide a strong base for developing Web usability

PSGs. Thus, we expected that the majority of the ARL academic libraries would have developed Web usability PSGs. However, the survey results clearly indicate that this is not the case because over 50% of the libraries had no PSGs.

Although the survey did not include a specific question asking for reasons for the lack of PSGs, both qualitative and quantitative responses provided possible explanations for the low number of library Web usability PSGs. Little knowledge of and support for Web usability from library administrators is evident in statements like “usability has just not been on the radar since the site was first constructed,” “it’s really a pain trying to connect with our administration on the topic of web design and usability, because even definitions are completely out the window;” and “the dean and the associate directors know little about the need for usability and view it as a last minute check-off, so they can say that the Web site is tested and usable.” Among stakeholders there is limited usability expertise and a naïve approach to Web usability which is highlighted by several libraries: “editors have very diverse skill sets—and not all are aware or fully understand the importance of standards-compliant pages,” “the primary difficulty is educating people and reminding them that there [sic] are guidelines to think about,” and “Web committee members are ignorant about integrating design with usability and focus on their own agenda.”

In addition, there is minimal organizational knowledge or cohesion to promote usability projects because “no person or group [is] officially in charge of checking or enforcing standards,” and staff members frequently work on a rotating or *ad hoc* basis which causes a lack of continuity and coherence. Workload is a factor in that a majority of the libraries repeatedly indicated having inadequate human resources necessary for usability initiatives: “understaffing and busy staff schedules,” “more time needs to be devoted to usability issues, but staffing shortages may be the main impediment,” and “we could be much more consistent in our application and testing of our web usability if we had dedicated staff resources.” The quantitative data confirms this shortage with only 20 libraries employing full-time usability staff.

Finally, it is quite possible that Web usability professionals have internalized principles and guidelines and put them into practice without written documentation. Respondents concur with this idea stating they “have a verbal policy—nothing is launched unless it has been tested at least one time. Usually designs are tested 2–4 times,” and that “we DO conduct extensive usability studies but have not written any policies or standards.” Because this is a very new area of technology, many Web developers may be using their own working knowledge and guidelines without having a formal print document.

There is evidence that over the next several years it may occur that Web usability PSGs experience a similar outcome as that of written collection development policies, which have increased in numbers during the last 30 years. In 1977, ARL surveyed 69 member libraries and found that only 20 had written collection policies. In 2003, Straw found that 88 of the 124 ARL member libraries had collection policies

available online. At the time of this current 2008 study, we discovered that 105 of the 113 academic ARL member libraries have collection policies online. Over time, there has been an increase in collection development policies; the development of Web usability PSGs might mirror this trend.

We speculate that there may be several other reasons for the lack of PSGs that are not addressed in the responses. First of all, many libraries may not be creating PSGs due to the difficulty related to conceptualizing a mental model. Because mental models vary across tasks—e.g., fact-finding versus in-depth research—it is hard to adequately create PSGs that fully represent a user’s mental model. Hence, some Web stakeholders may be reluctant to have PSGs, which may dictate too much structure and limit their flexibility.

Second, we believe that some libraries do not regard the lack of Web usability PSGs as a liability. Libraries have established circulation and collection development policies to support informed responses when patrons question a situation, such as an overdue book fine or a censorship complaint. So, of the participants’ library Web sites, 100% have circulation policies, and over 90% have collection development policies available online. In the case of Web usability, there does not seem to be a similar stimulus to create PSGs, because it is highly unlikely that a patron would issue a formal complaint that would require a policy-backed response. In addition, there are no government mandates or standards set forth by authoritative Web organizations, such as W3C. However, we counter that a library is liable when a Web site is not intuitive, because patrons who cannot successfully complete specific tasks may not revisit the site. Businesses tend to be more cognizant and concerned with usability issues because if customers cannot appropriately use their applications, it will be fiscally damaging to them. Because libraries are not profit-driven, the consequence of losing patrons is not as immediate as for commercial entities.

Another area of interest for us at the start of this research was the assumption that PSGs would influence the practice, which, in turn, could be measured by the amount of available resources and usability testing. The results indicate that over 85% of the libraries are conducting usability tests; however, there was no significant relationship between having PSGs and testing. This may be due to one or more of the reasons cited previously. Additionally, the respondents’ comments on the importance of usability testing may account for this result; 19 of them mentioned iterative testing, but only two brought up Web usability PSGs. The analysis also showed no relationship between PSGs and the availability of the resources needed to do usability testing. This may be because of some PSGs being university-wide and the actual resources would be supported at a higher level that was not measured.

We believed that the institutions with a higher ARL ranking would be more likely to have PSGs and invest more resources in their usability efforts. The data revealed that the ranking has no impact on the establishment of Web usability

PSGs. One explanation for this might be that many institutions have multiple libraries, and it is difficult to create a one-size-fits-all PSG. Comments supporting this observation include “our website, like most, is a complex conglomeration of services and resources that don’t always adapt easily to a common set of standards,” and “the libraries address very specific user needs respective to each library’s subject focus and it is hard to create a PSG that meets all patron and discipline needs.” Other studies have found that ARL ranking does not always affect practice as demonstrated by Lilly and Van Fleet (1999) in their study on accessibility of library home pages. Yet, we did find that there was a weak relationship between ARL ranking and resources available both for usability and testing lower-level pages. We speculate that the higher ARL ranking libraries use their extra resources for testing their lower-level pages rather than conducting additional testing on their main Web sites or OPACs. On a positive note, a majority of participating libraries are conducting usability testing, which in conjunction with results suggesting high-perceived importance of usability testing indicates that universally these libraries place a high value on usability.

Because iterative testing is essential to Web usability, we thought that participating libraries would test their Web sites throughout the development life cycle. Though the data indicates that over 85% of the libraries are testing for usability during at least one stage of the process, iterative testing was minimally conducted, especially for OPAC applications. We were not surprised at this because most OPACs are traditionally out-of-the-box vendor packages, which provide little to no opportunity for early design testing at the library. However, it would be expected that the other two platforms, main library Web pages and lower-level library Web sites, would be tested throughout the different cycles since they are in-house products; however, this is not consistently occurring.

This study was exploratory and, in retrospective, we found several limitations. Because the survey was sent to a pre-defined population, the results are not generalizable to all libraries. The survey was also a self-report, so the validity of answers could have been an issue. However, we included “other” as a response option and provided several follow-up questions to increase the level of validity. Respondents were also assured that their responses would be confidential and that the final research report would not identify specific institutions. Because the scope of this topic is very broad and we wanted to have a comprehensive picture of this subject, the survey became quite lengthy. Yet there were still areas where additional information would have been beneficial for the overall analysis. An example of this would be a follow-up question soliciting reasons why some libraries have no usability PSGs. We might have queried the make-up of the committees/task forces, which may have provided more insight into stakeholder representation. In addition, some questions that called for quantitative input were answered in a qualitative manner: e.g., hours devoted to usability efforts were often answered with “varies” rather than a

numerical figure. This caused limitations with our SPSS analysis.

Conclusion

This study investigated usability PSGs and resources currently available in the ARL academic libraries. Our intention was to measure current policies and practices. We were impressed that 85% of the participating libraries had conducted usability testing and yet surprised that only 30% of those libraries had PSGs. In-depth analysis of the data indicates that PSGs do not influence practices. In addition, the ARL ranking had little or no effect on the amount of PSGs, resources, or testing.

From this research, we found that the perceived importance of usability testing is very high. Additionally, the results provided insight into usability efforts, including difficulties. To address those issues, we suggest following recommendations that may help facilitate better usability practice. A top priority is to implement education on Web usability. It is vital that key players in the library—including administrators, Web developers, content creators, instruction librarians, and others—fully understand the meaning and value of Web usability. If these stakeholders are on the same page, there will be a greater chance for buy-in and a concerted effort for Web usability. Another important step is to provide support for hiring more dedicated Web usability staff; these individuals can advance educational and technical assistance, foster collegiality and expertise, and establish more stable and cohesive team effort. Finally, even though many libraries are working on usability initiatives without written Web usability PSGs, we strongly recommend that these libraries formally document their PSGs to guide Web usability practice. These PSGs can serve as informational resources for both organizational knowledge and the library community as a whole.

In the next phase of this research, we will conduct a comparison of the submitted PSGs to examine deeper perspectives on usability. Future research can focus on reviewing non-ARL academic libraries to provide a more generalizable analysis. In addition, research on the relationship between the existence of PSGs and how users perceive the usability of a Web site may shed additional insights. Furthermore, several participating institutions noted that they were moving their Web sites to a Content Management System (CMS). Because CMSs are out-of-the-box products, it is imperative that their usability characteristics be explored, or we foresee similar limitations to those found in OPAC applications.

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References

- Ascher, M., Lougee-Heimer, H., & Cunningham, D. (2007). Approaching usability: A study of an academic health sciences library Web site. *Medical Reference Services Quarterly*, 26(2), 37–53.
- Association of Research Libraries, Office of Management Studies. (1977). SPEC Kit 38: Collection Development Policies. Washington, DC: Association of Research Libraries.
- Augustine, S., & Greene, C. (2002). Discovering how students search a library Web site: A usability case study. *College & Research Libraries*, 63(4), 354–365.
- Battleson, B., Booth, A., & Weintrop, J. (2001). Usability testing of an academic library Web site: A case study. *Journal of Academic Librarianship*, 27(3), 188–198.
- Bevan, N., & Spinhof, L. (2007). Are guidelines and standards for web usability comprehensive? In J. Jacko (Ed.), *Human-computer Interaction, part I, international design and usability. HCI International 2007, LNCS 4550* (pp. 407–419). Berlin: Springer.
- Benjes, C., & Brown, J. (2001). Test, revise, retest: Usability testing and library Web sites. *Internet Reference Services Quarterly*, 5(4), 37–54.
- Bobay, J., Dallis, D., Pershing, G., & Popp, M.P. (2002). Working with consultants to test usability: The Indiana University Bloomington experience. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 60–76). Chicago, IL: American Library Association.
- Cervone, H.F. (2005). Usability training: An overlooked component in an on-going program of web assessment and development. *OCLC Systems & Services*, 21(3), 244–251.
- Chisman, J., Diller, K., & Walbridge, S. (1999). Usability testing: A case study. *College & Research Libraries*, 60(6), 552–569.
- Church, J., Brown, J., & VanderPol, D. (2002). Walking the Web: Usability testing of navigational pathways at the University at Nevada, Las Vegas Libraries. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 29–48). Chicago, IL: American Library Association.
- Clark, J.A. (2004). A usability study of the Belgian-American research collection: Measuring the functionality of a digital library. *OCLC Systems & Services*, 20(3), 115–127.
- Cobus, L., Dent, V., & Ondrusek, A. (2005). How twenty-eight users helped redesign an academic library Web site. *Reference & User Services Quarterly*, 44(3), 232–246.
- Cockrell, B.J., & Jayne, E.A. (2002). How do I find an article? Insights from a Web usability study. *Journal of Academic Librarianship*, 28(3), 122–132.
- Collins, K., & Aguinaga, J. (2002). Arizona State University West Library's experience: Categories from the users' point of view. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 16–29). Chicago, IL: American Library Association.
- Crowley, G.H., Leffel, R., Ramirez, D., Hart, J.L., & Armstrong, T.S. (2002). User perceptions of the library's Web pages: A focus group study at Texas A&M University. *Journal of Academic Librarianship*, 28(4), 205–210.
- D'Angelo, J., & Little, S.K. (1998). Successful Web pages: What are they and do they exist? *Information technology and libraries*, 17(2), 71–81.
- Dickstein, R., & Mills, V. (2000). Usability testing at the University of Arizona Library: How to let users in on the design. *Information Technology & Libraries*, 19(3), 144–151.
- Dumas, J.S., & Redish, J.C. (1993). *A practical guide to usability testing*. Norwood, NJ: Ablex Publishing Corporation.
- Feldman, S. (1999). The key to online catalogs that work? Testing: one, two, three. *Computers in Libraries*, 19(5), 16–20.
- George, C. (2005). Usability testing and design of a library website: An iterative approach. *OCLC Systems & Services*, 21(3), 167–180.
- Gibbs, W.J. (2002). Structured observation and protocol analysis: Using video split-screen technology for evaluating Web site usability. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 49–59). Chicago, IL: American Library Association.
- Goodwin, S. (2005). Using screen capture software for web site usability and redesign buy-in. *Library Hi Tech*, 23(4), 610–621.
- Grady, H.M. (2000). Web site design: A case study in usability testing using paper prototypes. In *Proceedings of IEEE Professional Communication Society International Professional Communication Conference and Proceedings of the 18th Annual ACM International Conference on Computer Documentation: Technology & Team work. ACM Special Interest Group for Design of Communications*, pp. 39–45. Piscataway, NJ: IEEE.
- Gullikson, S., Blades, R., Bragdon, M., McKibbin, S., Sparling, M., & Toms, E.G. (1999). The impact of information architecture on academic web site usability. *Electronic Library*, 17(5), 293–304.
- Hennig, N. (2002). Card-sorting usability tests of the MIT Libraries' Web site. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 88–99). Chicago, IL: American Library Association.
- International Organization for Standardization. (1998). *Ergonomic requirements for office work with visual display terminals* (1st ed.), DIS 9241-11. Part 11: Guidance on usability. London: Author.
- King, H., & Jannik, C. (2005). Redesigning for usability: Information architecture and usability testing for Georgia Tech Library's website. *OCLC Systems & Services*, 21(3), 235–243.
- Krug, S. (2000). *Don't make me think: A common sense approach to Web usability*. Indianapolis, IN: New Riders Press.
- Kuregger, J., Ray, R.L., & Knight, L. (2004). Applying Web usability techniques to assess student awareness of library Web resources. *Journal of Academic Librarianship*, 30(4), 285–293.
- Kyrillidou, M. (2000). Research library trends: ARL statistics. *Journal of Academic Librarianship*, 26(6), 427–436.
- Lilly, E.B., & Van Fleet, C. (1999). Wired but not connected: Accessibility of academic library home pages. *The Reference Librarian*, (67/68), 5–28.
- Lingle, V.A., & Delozier, E.P. (1998). Policy aspects of Web page development. *Internet Reference Services Quarterly*, 3(2), 33–48.
- Lombard, E., & Hite, L.A. (2007). Academic library Websites: Balancing university guidelines with user needs. *Journal of Web Librarianship*, 1(2), 57–69.
- Lynch, P.J., & Horton, S. (1999). *Web style guide: Basic design principles for creating Web sites*. New Haven, CT: Yale University Press.
- Manzari, L., & Trinidad-Christensen, J. (2006). User-centered design of a Web site for Library and Information Science students: Heuristic evaluation and usability testing. *Information Technology & Libraries*, 25(3), 163–169.
- McDonald, R.H. (2002). Building a user-centered e-presence at the Auburn University Libraries. In N. Campbell (Ed.), *Usability assessment of library-related Web sites: Methods and case studies* (pp. 29–48). Chicago, IL: American Library Association.
- McGillis, L., & Toms, E. (2001). Usability of the academic library Web site: Implications for design. *College & Research Libraries*, 62(4), 355–367.
- McMullen, S. (2001). Usability testing in a library Web site redesign project. *Reference Services Review*, 29(1), 7–22.
- Morrison, H.G. (1999). Online catalogue research and the verbal protocol method. *Library Hi Tech*, 17(2), 197–206.
- Nielsen, J. (1993). *Usability engineering*. Boston, MA: Academic Press.
- Nielsen, J. (1994). Heuristic evaluation. In J. Nielsen & R. Mack (Eds.), *Usability inspection methods* (pp. 25–62). New York: John Wiley & Sons, Inc.
- Nielsen, J. (2000). *Designing Web usability: The practice of simplicity*. Indianapolis, IN: New Riders Publishing.
- Norman, D.A. (1998). *The design of everyday things*. London: MIT.
- Popp, M.P. (2001). Testing library Web sites: ARL libraries weigh in. In *Proceedings of the ACRL Tenth National Conference*, pp. 277–281. Chicago, IL: American Library Association.
- Providenti, M., & Zai III, R. (2007). Web accessibility at academic libraries: Standards, legislation, and enforcement. *Library Hi Tech*, 25(4), 494–508.

- Rosenfeld, L.B., & Morville, P. (1998). *Information architecture for the World Wide Web*. Sebastopol, CA: O'Reilly.
- Rubin, J. (1994). *Handbook of usability testing: How to plan, design, and conduct effective tests*. New York: Wiley.
- Ryan, S. (2003). Library Website administration: A strategic planning model for the smaller academic library. *Journal of Academic Librarianship*, 29(4), 207–218.
- Shneiderman, B. (1998). *Designing the user interface: Strategies for effective human-computer interaction* (3rd ed.). Reading, MA: Addison Wesley.
- Shneiderman, B., & Plaisant, C. (2004). *Designing the user interface*. London: Pearson.
- Shropshire, S. (2003). Beyond the design and evaluation of library Web sites: An analysis and four case studies. *Journal of Academic Librarianship*, 29(2), 95–101.
- Spindler, T. (2002). The accessibility of Web pages for mid-sized college and university libraries. *Reference & User Services Quarterly*, 42(2), 149–154.
- Spool, J. (1997). *Web site usability: A designers' guide*. North Andover, MA: User Interface Engineering.
- Stover, M., & Zink, S.D. (1996). World Wide Web home page design: Patterns and anomalies of higher education library home pages. *Reference Services Review*, 24(3), 7–20.
- Straw, J. (2003). Collection management statements on the World Wide Web. *Acquisitions Librarian*, 15(30), 77–86.
- Thompson, S. (2003). Remote observation strategies for usability testing. *Information Technology & Libraries*, 22(1), 22–31.
- Thomsett-Scott, B. (2004). Yeah, I found it! Performing Web site usability testing to ensure that off-campus students can find the information they need. *Journal of Library Administration*, 41(3/4), 471–483.
- Thomsett-Scott, B. (2006). Web site usability with remote users: Formal usability studies and focus groups. *Journal of Library Administration*, 45(3/4), 517–547.
- Tolliver, R., Carter, D., & Chapman, S. (2005). Website redesign and testing with a usability consultant: Lessons learned. *OCLC Systems & Services*, 21(3), 156–166.
- Travis, T., & Norlin, E. (2002). Testing the competition: Usability of commercial information sites compared with academic library Web sites. *College & Research Libraries*, 63(5), 433–448.
- Turnbow, D., Kasianovitz, K., Snyder, L., Gilbert, D., & Yamamoto, D. (2005). Usability testing for web redesign: A UCLA case study. *OCLC Systems & Services*, 21(3), 226–234.
- Turner, N. (2002). Baffled, befuddled or bemused: Testing students' use of the online catalog. *College & Undergraduate Libraries*, 9(1), 71–79.
- United States Department of Health and Human Services. (2006). *Research-based Web design & usability guidelines*. Washington, DC: U.S. Government Printing Office.
- Valentine, B., & Nolan, S. (2002). Putting students in the driver's seat: Web usability testing on a shoestring. *Public Services Quarterly*, 1(2), 43–66.
- VandeCreek, L. (2005). Usability analysis of Northern Illinois University Libraries' Website: A case study. *OCLC Systems & Services*, 21(3), 181–192.
- van den Haak, M., De Jong, M., & Schellens, P. (2003). Retrospective vs. concurrent think-aloud protocols: Testing the usability of an online library catalogue. *Behaviour & Information Technology*, 22(5), 339–351.
- Veldof, J., & Nackerud, S. (2001). Do you have the right stuff? Seven areas of expertise for successful Web site design in libraries. *Internet Reference Services Quarterly*, 6(1), 13–38.
- Veldof, J., Prasse, M., & Mills, V.A. (1999). Chauffeured by the user: Usability in the electronic library. *Journal of Library Administration*, 26(3/4), 115–140.
- Ward, J. (2006). Web site redesign: The University of Washington Libraries' experience. *OCLC Systems & Services*, 22(3), 207–216.
- Ward, J., & Hiller, S. (2005). Usability testing, interface design, and portals. *Journal of Library Administration*, 43(1/2), 155–171.
- Welch, J.M. (2000). Chaos or control freaks: Academic library Web Site evaluation and management. *Proceedings of the Fifteenth National Conference on Integrated Online Library Systems*, pp. 167–180. Medford, NJ: Information Today.
- Wang, M., & Ring, D.M. (2007). A student-focused usability study of the Western Michigan University Libraries home page. *Journal of Web Librarianship*, 1(3), 67–88.
- Wroblewski, L., & Rantanen, E.M. (2001). Design considerations for Web-based applications. *Proceedings of the 45th Annual Meeting of the Human Factors and Ergonomics Society*. Human Factors and Ergonomics Society, pp. 1191–1195. Santa Monica, CA: Human Factors and Ergonomics Society.

Appendix

Survey Questions

Q 1 Does your library have a Web site policy, guidelines or standards which address usability issues?

Yes
No

Q 1a If your Web policy, guidelines or standards are available electronically, please provide the URL.

Q 1b Please rate the level of difficulty of implementing the policy, guidelines or standards.

Not Difficult
Slightly Difficult
Moderately Difficult
Very Difficult
Extremely Difficult

Q 1c If you have had difficulties implementing your policy, guidelines or standards, please describe them below:

Q 2 Regardless of your response to Q 1 about a general Web site policy, does your library have specific policies, guidelines, or standards regarding Web usability?

Yes
No

Q 2a If your Web usability policy, guidelines or standards are available electronically, please provide the URL.

Q 2b Please rate the level of difficulty of implementing the Web usability policy, guidelines or standards.

Not Difficult
Slightly Difficult
Moderately Difficult
Very Difficult
Extremely Difficult

Q 2c If you have had difficulties implementing your Web usability policy, guidelines or standards, please describe them below:

Q 3 Does your college or university provide an institutional Web usability policy, guidelines or standards?

Q 3a If your institution's Web usability policy, guidelines or standards are available electronically, please provide the URL.

Q 3b Does your library follow this institutional policy, guidelines or standards?

Yes
No

Q 3c Why doesn't your library follow this institutional policy, guidelines or standards?

Q 3d Please rate the level of difficulty of implementing the policy, guidelines or standards.

Not Difficult
Slightly Difficult
Moderately Difficult
Very Difficult
Extremely Difficult

Q 3e If you have had difficulties implementing your university's Web site policy, guidelines or standards, please describe them below:

Q 4a What kinds of committees or task forces does your library have to oversee Web usability?

Usability Committee
Web Advisory Committee
Web Site Usability Subcommittee
Other (Please Specify)

Q 5a How important is usability testing in your library?

Not Important
Somewhat Important
Important
Very Important
Extremely Important

Q 5b Please use the space below if you have any more specific comments about the importance your library places on usability testing.

Q 6 Please define Web usability in your own words.

Q 7a Has your library conducted any usability testing of its Web sites?

Yes
No (The survey will skip to Question 11)

For each section below, please enter the number of times you have conducted usability testing in each category.

Q 7b Main Library Web Site: None 1 2 3 4 5 or more

Pre-Web Site Development
During Web Site Development
Post-Web Site Development

Q 7c OPAC: None 1 2 3 4 5 or more

Pre-Web Site Development
During Web Site Development
Post-Web Site Development

Q 7d Lower Level Library Web Pages: None 1 2 3 4 5 or more

Pre-Web Site Development
During Web Site Development
Post-Web Site Development

Q 8 If you perform Web usability testing, which populations are included?

Administrators
Alumni
Faculty
Graduate Students
Undergraduate Students
Public Users
Non-Library Users
Information Technology (IT) Professionals
Persons with Disabilities
Researchers
Staff
Other (Please Specify)

Q 9 Which usability testing methods have you used?

Card Sorting
Cognitive Walk-Through
Filmed Observation
Heuristic Evaluation
In-Person Observation
Keystroke Path Collection
Paper Prototyping/Storyboarding
Task Analysis
Thinking Aloud
Other (Please Specify)

Q 10 Did you use any of the methods listed below to receive additional input on library Web usability?

Focus Groups
Interviews
Listserv Postings
Pop-Up Windows Via the Library Web Site
Surveys
Website "Call for Input"
Other (Please Specify)

Q 11 If your library has not conducted Web usability testing, what are the reasons for that?

Q 12a Does your library have a regular staff member who is primarily dedicated to issues of Web usability? (i.e. Web usability is the main focus of his or her job.)

Yes
No (Please continue with Question 13a)

Q 12b If yes:

Is that staffer full-time or part-time?

Roughly how many hours of that person's typical work-week are dedicated to Web usability?

In which unit or department of the Library is this person employed?

What is this person's title?

Q 12c What types of training has this staff member had regarding Web usability? (Please check all that apply.)

Training in human-computer interaction

Training in Web usability

Degree or certificate in Information Science

No specific training

Other (Please Specify)

Q 13a Regardless of your response to the previous question, does your library have any (additional) regular staff member whose regular duties include issues of Web usability?

Yes

No (Please continue with Question 14a)

Q 13b If yes:

Is that staffer full-time or part-time?

Roughly how many hours of that person's typical work-week are dedicated to Web usability?

In which unit or department of the Library is this person employed?

What is this person's title?

Q 13c What types of training has this staff member had regarding Web usability? (Please check all that apply.)

Training in human-computer interaction

Training in Web usability

Degree or certificate in Information Science

No specific training

Other (Please Specify)

Q 14a Regardless of your responses to the previous questions, do you receive assistance from another unit of your University (e.g., Information Technology), or do you hire an outside consultant for Web usability projects?

Yes, Another Unit of the University

Yes, An Outside Consultant

No (Please continue with Question 15)

Q 14b If yes:

What is the title of your library staff member who coordinates or oversees the activities of these entities?

In which unit or department is the coordinator employed?

Q 15 Please use the space below if you would like to elaborate on your Library's staff alignment with regard to issues of Web usability.

Q 16 Please provide details on future Web usability plans your library may have.

Q 17 Please feel free to provide any additional comments you may have about library Web site usability.

Q 18 What is the name of your institution? (Again, no identifying information will be included in any reports or publications.)

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